

BASIC DRY SCRUBBER OPERATIONS

General Discussion

Prior to the introduction of the dry scrubber system in early 1979, the Columbia Falls plant utilized a wet scrubbing system for the removal of pollutants (primarily HF) from collected pot gases. These gases were sprayed with a lime slurry which converted the fluorides to an insoluble CaF_2 sludge. The sludge was pumped to a disposal area, and the cleaned gases were emitted to the atmosphere. This system was 98.5% efficient in fluoride removal, emitting about 300 pounds F per day.

The dry scrubber operates on a similar principal. The collected gases are forced through dry alumina ore. The fluoride reacts with the alumina, converting the Al_2O_3 to AlF_3 . Approximately 2% of the alumina is converted to AlF_3 . The reaction is 99.9% efficient, allowing only 16 pounds per day of fluoride to be emitted.

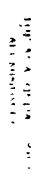
In addition to pollutant removal, the dry scrubber provides a source of AlF_3 from the recycled fluoride gases. AlF_3 is a necessary chemical in the electrolytic reduction of alumina, and along with other chemicals, must be purchased. The reacted ore from the dry scrubber supplies the plant with approximately 75% of the AlF_3 needed to operate the pots.

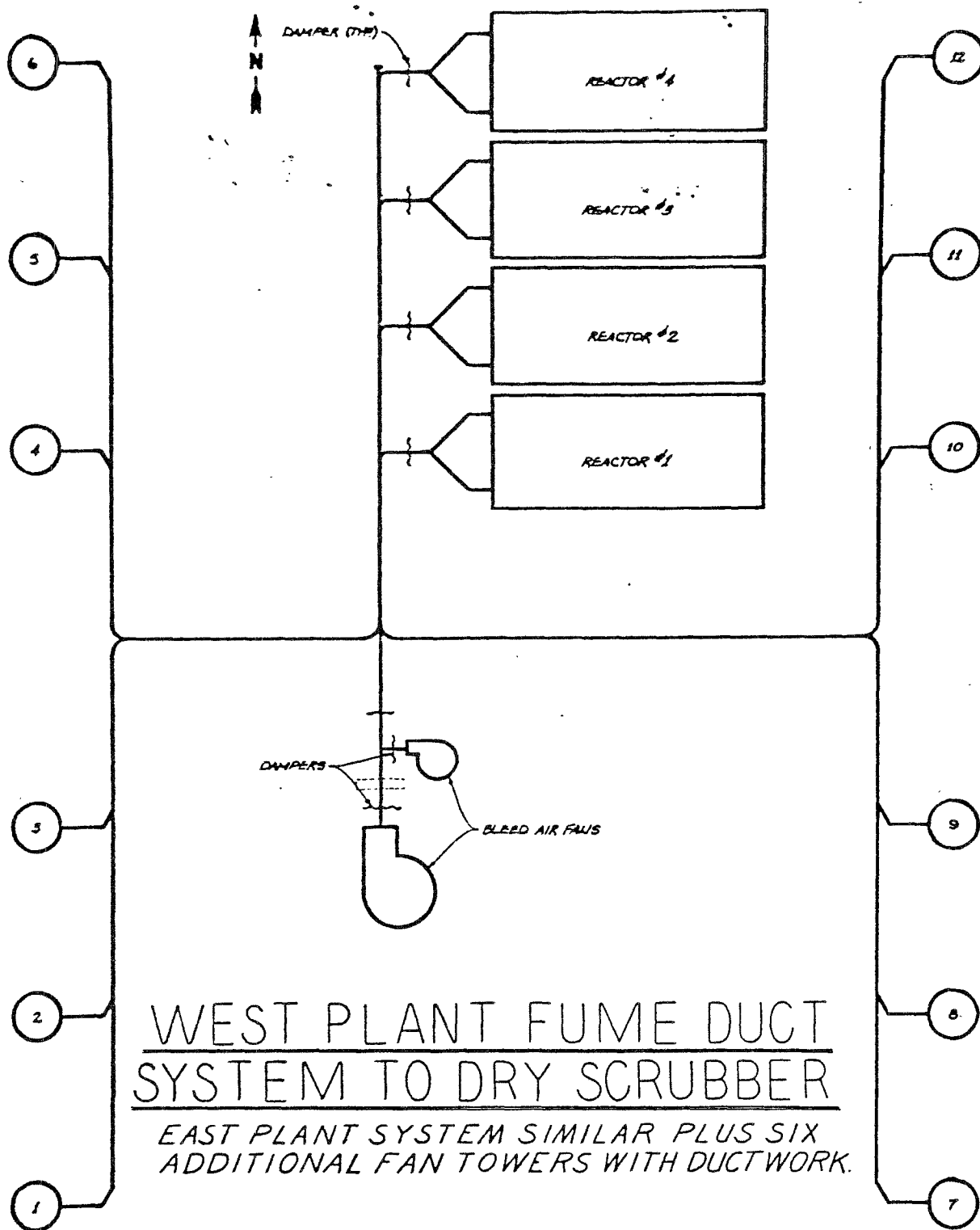
System Description

As pot gases are generated by the electrolytic reaction, they are kept confined and collected within the cell by means of a cast iron skirt around the periphery of the anode. Each end of the pot is equipped with a burner through which gases are routed in order to oxidize volatile compounds.

Approximately 350 SCFM of gas is generated per pot. Each 20 pot group is connected to a duct network which feeds to a 100 hp, 12,000 ACFM fan. There are 12 such fans in the west plant system (potlines 1 and 2) and 18 in the east plant (lines 3, 4 and 5), servicing 240 and 360 pots, respectively. The west and east plant fans are connected to common manifolds, forming a positive pressure system leading to 4 west plant and 6 east plant A-398-type dry bed reactors. Each reactor unit is rated at 45,000 ACFM at 220°F gas temperature.

Incoming alumina ore from the storage silos (3 west plant, 4 east plant) is delivered to the reactors by a system of air slides and lift pots. Fresh ore feeding at a rate of 150 ft³ per hour is reacted with the hydrogen fluoride in the waste pot gases. From the reactor beds, the waste gases pass through pulse-jet type baghouses where the last stage of fluoride recovery takes place. Each baghouse contains 896 bags (56 rows of 16 each). The reacted ore is then delivered by lift pots to storage silos, and from the silos is fed directly to the pots, completing the recovery cycle.





DUCT SYSTEM